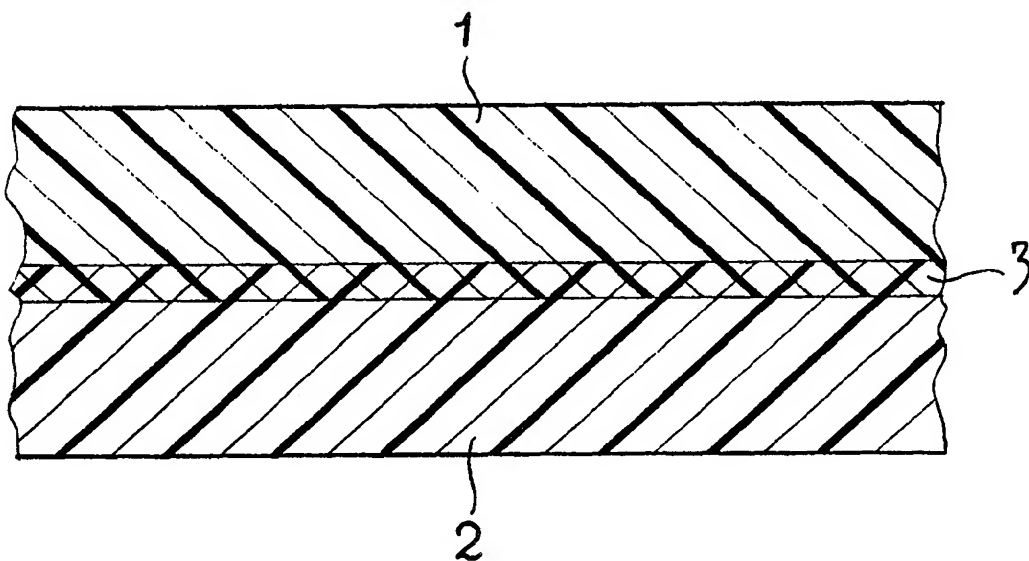


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>B32B 27/08, B65D 65/40, 81/34</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/38917</b>  <b>(43) International Publication Date:</b> 6 July 2000 (06.07.00)		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> <b>(21) International Application Number:</b> PCT/NO99/00380  <b>(22) International Filing Date:</b> 15 December 1999 (15.12.99)   <b>(30) Priority Data:</b>            19986070                      23 December 1998 (23.12.98)      NO   <b>(71) Applicant (for all designated States except US):</b> DYNO            INDUSTRIER ASA [NO/NO]; P.O. Box 779, Sentrum,            N-0106 Oslo (NO).   <b>(72) Inventor; and</b>  <b>(75) Inventor/Applicant (for US only):</b> NYTRÖ, Morten [NO/NO];            Husbylia 19, N-7500 Stjørdal (NO).   <b>(74) Agent:</b> CURO AS; P.O. Box 38, N-7231 Lundamo (NO).         </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> <b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG,            BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB,            GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG,            KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK,            MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG,            SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU,            ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL,            SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ,            MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE,            DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE),            OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML,            MR, NE, SN, TD, TG).   <b>Published</b>  <i>With international search report.</i>  <i>Before the expiration of the time limit for amending the</i>  <i>claims and to be republished in the event of the receipt of</i>  <i>amendments.</i>  <i>In English translation (filed in Norwegian).</i> </td> </tr> </table>			<b>(21) International Application Number:</b> PCT/NO99/00380 <b>(22) International Filing Date:</b> 15 December 1999 (15.12.99)  <b>(30) Priority Data:</b> 19986070                      23 December 1998 (23.12.98)      NO  <b>(71) Applicant (for all designated States except US):</b> DYNO INDUSTRIER ASA [NO/NO]; P.O. Box 779, Sentrum, N-0106 Oslo (NO).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> NYTRÖ, Morten [NO/NO]; Husbylia 19, N-7500 Stjørdal (NO).  <b>(74) Agent:</b> CURO AS; P.O. Box 38, N-7231 Lundamo (NO).	<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i> <i>In English translation (filed in Norwegian).</i>
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<b>(54) Title:</b> BI-LAYER PLASTIC CONTAINER				
				
<b>(57) Abstract</b>  <p>Container of twin-layer plastic, especially to be used in catering. An inner layer (1) is formed of a stain resistant plastic material, e.g. polyetherimide, polyether sulphone or polyphenyl sulphide, and an outer layer (2) is formed from a heat durable plastic material, e.g. liquid crystal polymer, aromatic polyketone, polyarylate, polyphthalamide or poly(cyclo hexylene dimethylene terephthalate). The layers should be at least 0,3 mm thick, preferably 1,4 mm, and the total thickness of the layers should be at least 1 mm, preferably 2,5 – 3,0 mm.</p>				

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Bi-layer plastic container

The invention relates to a container of twin-layer plastic.

## 5 Background

Plastic containers for holding different materials, such as food, have been on the market for a long time. The problem with known containers is that they do not meet all the demands of being an effective food container, e.g. where food is to be both heated and eaten, from the same container. An effective food container must be durable towards both  
10 heat and discolouring. If it is not durable towards discolouring, staining, it will be stained during use, and thereby limit the number of times it is possible to use the container, since service/cooking of food on a stained foundation, will be considered both unhygienic and unappetizing. The container should also be usable in microwaves and ordinary ovens, and be able to be washed in dishwashers. It should therefore be chemical resistant towards  
15 dishwashing liquids of different kinds. As it should be used at least 20-30 times, the colour should not fade either. In addition, such a container should be simple and economic to produce, and meet applicable standards from, for example FDA and BGA.

For a long time, different materials have been tried in order to produce such containers, until now, no materials with satisfying qualities have been found. No known materials are  
20 both satisfyingly heat and stain durable.

## Object

The main object of the present invention, is therefore to provide a container that can be used as an effective food container, especially for food which is to be heated. It is a  
25 particular object to provide a container that can withstand high temperatures, so that it may be used in an oven, but that also can be produced at reasonable costs.

## The invention

The object is fulfilled with a container according to the characterizing part of patent  
30 claim 1. Further features are given in the dependent claims.

The combination of the materials which are used in the container according to the invention, results in a container that meets all demands of an effective food container.

**Example**

The container will be described hereinafter, with reference to the figures which are illustrative only and not intended to be limiting to the invention, where

Fig. 1 shows, in cross section, a container according to the invention,

5 Fig. 2 shows an enlarged cross section of the wall of the container shown in Figure 1.

Figure 1 shows the cross section of the container, including an inner layer 1 and an outer layer 2 which are in contact with each other along the whole of the container. The container is configured with slightly sloping walls, in such a way that it is easier stack, and thereby  
10 occupies thereby minimal space when empty for transportation and storage.

The container is twin-layered, an enlarged cross section is shown in Figure 2, where the outer layer 2 is of a heat durable plastic, such as LCP (liquid-crystal-polymer), aromatic polyketones, polyarylates, polyphtalamides or poly(cyclohexylene dimethylene terephthalat). The inner layer 1, i.e. the layer which in use, is in contact with the food, is of a plastic that  
15 is durable towards discolouring, staining, for example polyetherimide, polyphenylsulphide, polyethersulphone or polysulphone.

Containers with the outer layer 2 of one of the stain durable materials which are mentioned above, and the inner layer of one of the heat durable materials which are mentioned above, can also be made. However, it will not be possible to use these several  
20 times, in any case not 20-30 times. This is due to the fact that the heat durable material is not stain durable, and stains that are difficult to remove will therefore occur.

The ratio between the layers can be varied, and the characteristics of the container will vary accordingly. With a thin inner layer 1, the container can be used fewer times, and it will stain easily. If the outer layer 2 is reduced, the container will only withstand low  
25 temperatures, and if it is increased, the temperature resistance will increase accordingly.

The ratio between the layers can be varied, but each layer 1,2 must at least be 0,3 mm thick, and the total thickness of the container wall must be at least 1 mm. The optimal thickness of each layer is about 1,4 mm, and the total thickness is optimal between 2,5 and 3,0 mm.

A container according to the invention can be produced by moulding one of the layers,  
30 and then spraying or moulding the other on top. When the second layer is laid over, a thin layer of the first layer will melt on the interface 3 (contacting surfaces), and the materials will blend somewhat in a thin layer. The individual molecules will therefore get close to each other, and a strong bond between the layers will be obtained. The bond will be a combination of melting together, and chemical binding.

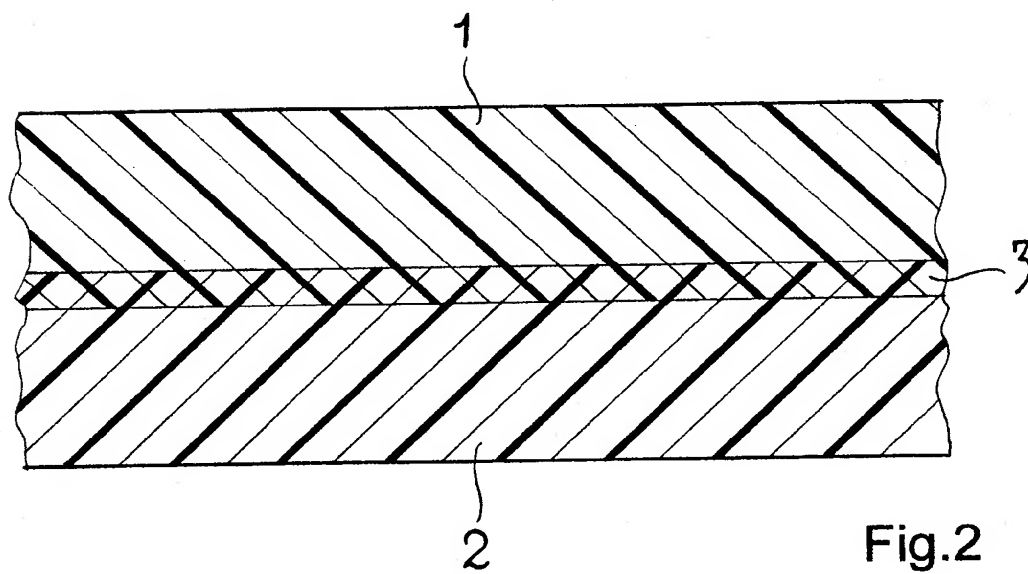
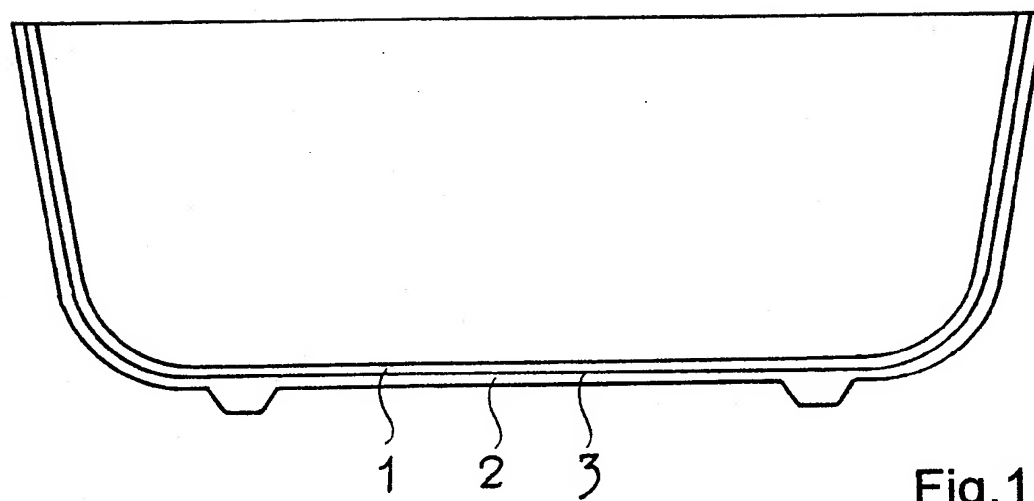
In case the second layer moulds over, the first layer will be moulded in a first mould, and then transferred to a second mould, where at least one part of the mould is a little larger than the first mould. The first layer will be fastened to the part of the mould, having the same size as the first mould, and the other layer will be moulded in the space which is  
5 created between the first layer and the mould.

The containers which are shown in the figures were performed by moulding the first layer at 400°C. Then it was cooled to the right demoulding temperature (160°C) before it was moved to a new organ, which moulded the second layer over, at 330°C. After cooling, the container was finished, and could be used.

10 The container can withstand large temperature oscillations, and therefore it is preferable if the expansion coefficient for the two materials which are to be connected, are quite even. However, the chemical/thermal bond at the interface 3, is probably so strong that the container will not split even if it is produced from two materials with different expansion coefficients.

## Claims:

1. Container of twin-layer plastics, especially for use in catering,  
**characterized** in that
  - the inner layer (1) is chosen from one of the plastics which is durable towards
  - 5 discolouring; polyetherimide, polyethersulphone, polysulphone or polyphenylsulphide, and
  - the outer layer (2) is chosen from one of the plastics which is heat durable; liquid-crystal-polymer, aromatic polyketone, polyarylate, polyphtalamide or poly(cyclohexylene dimethylene terephthalate).
- 10 2. Container according to claim 1,  
**characterized** in that the heat durable plastic is poly(cyclohexylene dimethylene terephthalate).
3. Container according to claim 1 or 2,  
15 **characterized** in that each layer is at least 0,3 mm thick, and the total thickness of the container wall is at least 1 mm.
4. Container according to claim 3,  
**characterized** in that each layer is about 1,4 mm thick, and the total thickness of the  
20 container wall is 2,5 to 3,0 mm.
5. Method for producing a container according to any of the preceeding claims,  
**characterized** in that firstly, one of the layers is moulded, and then the other layer is moulded or sprayed over.



# INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 99/00380

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B32B 27/08, B65D 65/40, B65D 81/34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B32B, B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0182029 A2 (GENERAL ELECTRIC COMPANY), 28 May 1986 (28.05.86), page 1, line 24 - line 32; page 5, line 30 - line 34; page 6, line 3 - page 7, line 2, claims; abstract	1,3-5
Y	--	2
Y	WO 9606125 A1 (EASTMAN CHEMICAL COMPANY), 29 February 1996 (29.02.96), page 1, line 24 - line 25	2
Y	EP 0166243 A2 (UNION CARBIDE CORPORATION), 2 January 1986 (02.01.86), page 2 - page 4, claims; abstract	1,3-5
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☒ Further documents are listed in the continuation of Box C.

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Date of the actual completion of the international search

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Facsimile No. +46 8 666 02 86

Authorized officer

Monika Bohlin/Els

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 99/00380

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	File WPI, Derwent accession no. 1975-55375W, DU PONT DE NEMOURS & CO E I: "Polysulphone/ silicone resins compsn for coating metal vessels - for high quality bake ware, has decorative, non-stick, wear resistant props"; UST937005I I 19750805, DW197533  --	1,3-5
A	File WPI, Derwent accession no. 1989-237382, KURARAY CO LTD: "Heat-resistant oven container - consists of all-aromatic polyester capable forming optically anisotropic melt phase"; JP,A,1171515, 19890706, DW198933  --	1-5
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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

02/12/99

International application No.

PCT/NO 99/00380

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